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Adsorption of volatile hydrocarbons on natural zeolite-clay material

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Abstract

This study investigated the vapor-phase sorption of hydrocarbons (HC) of various chemical nature (n-hexane, iso-octane, benzene, toluene and p-xylene) on zeolite-clay material (ZCM) of Tatarsky-Shatrashansky deposit (Tatarstan, Russia). For comparison, we also studied HC sorption on natural high-grade zeolite (Z) of St. Cloud Mine (New Mexico, USA), two local bentonite clays and synthetic zeolite-molecular sieve Ms5A. As a result, sorption capacity of ZCM towards aliphatic and aromatic HC was significantly higher than the sorption capacity of Z but lower than that of clays. In addition, the data showed that HC sorption on ZCM occurs as surface adsorption. The comparison with Ms5A and erionite ZAPS, a natural Mexican zeolite, revealed that both ZCM and Z do not interact as microporous selective sorbents with linear alkanes. The main differences in HC sorption on ZCM and Z were ZCM higher sorption capacity towards both aliphatic and aromatic HC, as well as its lower sorption sensitivity to the type of HC. We found that the reason for these differences is the presence of large amount of clay minerals in ZCM. To summarize, ZCM can be considered as a suitable adsorbent for protection and remediation of HC-contaminated soils.

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Keywords

Hydrocarbons, Vapor-phase sorption, Zeolite-containing materials